

Without creating one new material substance, or destroying any of the existing ones, God may accomplish that change—rather than destruction, to which the author of the Epistle to the Hebrews points, as the precursor of the new heavens and new earth—"As a vesture shalt thou fold them up, and they shall be changed."

ILLUSTRATIVE NOTE (B).—LAWS OF PHENOMENA, CAUSES OF PHENOMENA
CONDITIONS OF THE OPERATION OF CAUSES.

The views partially exhibited in the text are fitted, if carried out, to furnish, in our apprehension, some assistance in introducing order into a topic which is still somewhat confused—the logic of physical investigation. We must not be tempted to enter far into a subject which we feel ourselves incapacitated to grapple with in all its extent. The few observations which we have to offer may be best delivered in the shape of a brief review of the two learned and philosophical works of Dr. Whewell on the History and Philosophy of the Inductive Sciences.

This author, throughout these works, has made a frequent and profitable use of the distinction between the inquiry into the laws of phenomena and the causes of phenomena. "Inductive truths are of two kinds—laws of phenomena, and theories of causes. It is necessary to begin in every science with the laws of phenomena, but it is impossible that we should be satisfied to stop short of a theory of cause**." In physical astronomy, physical optics, geology, and other sciences, we have instances showing that we can make a great advance in inquiries after the true theories of causes.**

In illustrating this remark, he states, that in "their first attempts men discovered an order which the phenomena follow, rules which they obey; but they did not come in sight of the powers by which these rules are determined—the causes of which this order is the effect. Thus, for example, they found that many of the celestial motions took place, as if the sun and stars were carried round by the revolution of certain celestial spheres; but what causes kept these spheres in constant motion they were never able to explain. In like manner, in modern times, Kepler discovered that the planets describe ellipses before Newton explained why they select this particular course, and describe it in a particular manner. The laws of reflection, refraction, dispersion, and other properties of light, have long been known; the causes of these laws are at present under discussion."

"Hence the larger part of our knowledge of nature, not least of the certain portion of it, consists of the knowledge of the laws of phenomena. In astronomy, indeed, besides knowing the rules which guide the appearances, and resolving them into

the real motions from which they arise, we can refer these motions to the forces which produce them. In optics, we have become acquainted with a vast number of laws, by which varied and beautiful phenomena are governed; and perhaps we may assume, since the evidence of the undulatory theory has been so fully developed, that we know also the causes of the phenomena. But in a large class of phenomena, while we have learned many laws of phenomena, the causes by which these are produced are still unknown or disputed. Are we to ascribe to the operation of a fluid or fluids—and if so, in what manner—the facts of heat, magnetism, electricity, galvanism?—what are the forces by which the elements of chemical

* *Philosophy of Natural Science*, 2d edit. vol. 11. Art. concerning *Koinon*, 24